ATTACHMENT R-3

WELLFIELD CLOSURE COSTS

Contents

Tables

Executive Summary

A closure strategy and cost estimate for the Stage 1 Gunnison ISR wellfield has been developed in accordance with ADEQ, ADWR, EPA UIC, and BADCT guidelines. The closure activities will include ISR wellfield rinsing, pullback pumping, rinsing verification monitoring, well abandonment, and post-closure monitoring.

An Aquifer Protection Permit (APP) from ADEQ will be required in addition to the Underground Injection Control (UIC) permit from the EPA. Separate bonds will be held for closure costs associated with the APP and the UIC. The APP bond will consist of pond closure and POC well abandonment costs. The UIC bond will consist of all other costs including rinsing, well abandonment (excluding POCs) pullback pumping, work plans, mobilization, reporting and post closure monitoring.

The closure cost details presented in this attachment are the same as those provided to ADEQ for the APP except for the ponds and the abandonment of the POC wells which have been excluded.

The most extensive closure activity will be the rinsing of the wellfield that will require flushing the leached formations with clean water, the extraction of the impacted rinse water, and evaporating it in the Gunnison Evaporation Pond #1. Costs have been developed for general administration, wellfield labor and maintenance, power for wellfield pumps needed for rinsing, mechanical evaporators, rinsing verification monitoring, and post-closure monitoring.

Well abandonment will be conducted according to ADWR guidelines by removing the wellhead piping and pumps followed by grouting the boreholes in accordance with EPA UIC requirements. Wells scheduled for abandonment include injection and recovery wells, hydraulic control wells, observation wells, intermediate monitor wells (IMWs), rinse verification wells, and Point-of-Compliance (POC) wells. Costs for abandonment were developed using third party contractor costs and include labor and supervision, pre-grouting activities, grouting, perforation (where applicable), casing removal to two feet below the surface, and debris removal.

The costs for ISR wellfield closure by each year are presented in Table R3-1 for the ten years covering Stage 1 production. Credits have also been tabulated for the cost of closure activities that will have been completed by a given year. From the table, the maximum liability ($8.47 million) occurs in Year 10. The closure costs will be re-evaluated in Year 6. From Table R-1, the difference in cost between Year 10 and Year 6 is approximately $700,000 that can be used as a contingency for additional pullback pumping if required in Years 1 through 6.

Table R3-1: Summary of Closure Costs and Closure Credits by Year ($Millions)

Table: Summary of Closure Costs and Closure Credits by Year ($Millions)										
Item	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**	**Y7**	**Y8**	**Y9**	**Y10**
Rinsing	1.708	2.175	2.623	3.013	3.041	3.159	3.039	3.091	2.962	2.993
Well Abandonment	1.091	1.496	1.754	2.150	2.518	2.878	3.499	3.554	3.556	3.626
Other**	0.336	0.340	0.343	0.345	0.345	0.346	0.345	0.345	0.345	0.345
Pullback Pumping	1.850	1.539	1.254	0.995	0.902	0.834	0.897	0.865	0.933	0.923
Contingency (10%)	0.499	0.555	0.597	0.650	0.681	0.722	0.778	0.785	0.779	0.789
Total (no credit)	5.484	6.104	6.571	7.153	7.486	7.939	8.558	8.640	8.574	8.676
Credit	0.000	0.000	0.000	0.000	-0.132	-0.085	-0.164	-0.123	-0.136	-0.120
Total with credit	5.484	6.104	6.571	7.153	7.353	7.854	8.394	8.517	8.439	8.556

**Costs for work plans, mobilization, reporting, and post closure monitoring

Closure Plan for the ISR Wellfield

Closure of the ISR wellfield will consist of rinsing and neutralization of the portions of the formation that have been exposed to leach solution. The wells will be closed and abandoned in accordance with UIC regulations and Arizona Department of Water Resources (ADWR) guidance after rinsing has reduced all constituents to primary MCLs and Arizona Aquifer Water Quality Standards (AWQSs).

Metallurgical test results and geochemical modeling indicate that neutralization and constituent concentration reduction to appropriate levels can be accomplished by a three-step process (as described in Attachment H-2). First, the acidified leaching solution is replaced with clean water to dilute the concentration of leach solution in the formation to approximately 5 percent (Attachment H-3). Second, active circulation of solutions within the subject portion of the wellfield is suspended for approximately 200 days to neutralize the acid. Geochemical modeling based on mineralogy indicates that the leached formation will have sufficient acid neutralizing potential to raise the pH to near neutral. The third step is additional flushing with clean water to reduce regulated constituents to acceptable concentrations. The first rinsing step will require three pore volumes and the second rinse (third step) will require two pore volumes (Attachment H-2). AWQSs and primary MCLs are expected to be met after the rest period (except for a possible minor exceedance of the fluoride AWQS/MCL); the two additional pore volumes are a contingency to provide extra confidence in the expected results.

Clean water for rinsing during Stage 1 production will be provided by water supply wells and unimpacted hydraulic control water. Water for rinsing Stage 2 and Stage 3 wells is anticipated to also include recycled water from a water treatment plant constructed in later stages. For Stage 1, rinse water will directly flow by gravity from the Fresh Water Tank on the Johnson Camp Mine property. In Stages 2 and 3, water for rinsing will be pumped from the Clean Water Pond. Rinse water will be injected into the production wellfield. Extracted water will be pumped to the Evaporation Pond for natural and mechanical evaporation. The "first flush", which can be considered the first pore volume, from Step 1 rinsing will contain sufficient copper grade for economical extraction in the SX-EW plant. After the copper concentration drops below the economic threshold, the remainder of rinsate extracted will be sent to the Evaporation Pond.

Rinsing is considered complete when the concentrations of all constituents are at or below AWQSs and primary MCLs. Wells that are accepted as being sufficiently rinsed[1] will be abandoned in accordance with EPA and ADWR criteria. The wells will be grouted from bottom upward using a tremie pipe to eliminate its ability to act as a conduit for solution migration.

1 With the exception of wells that will be used as Rinse Verification and Closure Verification wells. These will be left open for monitoring and abandoned later according to the closure strategy.

ISR Wellfield Closure Liability

When wells are added and put into production, they are assumed to accrue a liability for the complete three step rinsing, as described above. This liability includes all the components of rinsing, verification, and abandonment. This liability continues to grow until rinsing begins. As the rinsing and closure of wells progresses, the liability is reduced in the year that operations are completed in the form of rinsing credits and the removal of wells from the number that need to be abandoned for the subject year. For example, if 183 wells are present at the beginning of the year, 16 are closed (abandoned), and 14 are added, the year-end liability for well abandonment is 181.

The process of rinsing the production wellfield is expected to take approximately two years, since the time duration is dominated by the need to "rest" the wells in order to neutralize the solution. If there are 40 cells (five spot patterns) that need to be rinsed, the first 20 are rinsed for approximately 200 days to achieve three pore volumes of rinsing. The first 20 cells are put into “resting mode” while the second group of 20 cells is rinsed with three pore volumes. The second group is rested while the first group is rinsed with the final two pore volumes for approximately 130 days. After 70 more days of “resting,” the second group of wells is rinsed for the final 130 days with an elapsed time of 730 days or 2 years. The volume of cumulative rinsing liability (in gallons) is divided by 576,000 gallons (400 gpm x 60 min x 24 hrs) to approximate the time (in days) for rinsing all of the wells. An additional 10% is added to the time to account for overlaps and inefficiencies in moving from one group of cells to the next.

Costs to complete the wellfield closure and abandonment process have been estimated for each year of Stage 1. Closure of the spent portions of the wellfield is planned to take place throughout the life of the operation beginning in Year 5 when rinsing will begin of the first wells that are anticipated to produce copper concentrations that fall below economic cutoff. These costs are based on evaluating the annual closure liability for each year of Stage 1 operation if the project were to shut down.

Pullback Pumping

Pullback pumping costs are included in the closure costs to allow for the capture of potential solution excursions from the active mining blocks. The pullback pumping will draw down the water table and ”pull back” solutions into the mining area. The pullback pumping will be conducted in conjunction with rinsing of the wellfield.

In the model simulations, particles initially migrate away from mining blocks during operations but then the paths are reversed and particles are captured when recovery or pullback pumping operations begin after a mining year. The modeling shows that all particles are captured within 3 years after pullback pumping starts, with most being captured within one year of pullback pumping. Model simulations were made to evaluate capture in Years 1 and 5 and used to estimate the costs for pullback pumping for all of Stage 1. Excelsior does not believe modeling closure scenarios after year 5 is necessary given that Excelsior will be reviewing the model performance as compared to actual operations as part of the planned review of closure cost bonding after year 6. Modeling at that time will incorporate updates based on operations and monitoring data.

The assumptions used for the pullback pumping simulations are conservative because normal mine operations will create a "sweep" effect outside the perimeter of a mining block specifically to recapture mining solutions as part of the normal recovery operations (i.e. without pullback pumping). Also, no control strategies are simulated, such as local over-pumping to control detected excursions. Pullback pumping will draw in clean water which will naturally rinse the mining area.

It was assumed that after Year 1 and Year 5 of mining, recovery wells around the perimeter of the blocks would be operated to pull back any potential solutions as represented by particles in the model. For the Year 5 scenario, the two hydraulic control (HC) wells along the southern boundary of the wellfield also need to be operated.

Costs for the pullback pumping have been estimated for each year of Stage 1. The additional labor and power costs for pullback pumping have been included with the closure costs.

Closure Cost Estimation for Bonding

The following sections provide details on the various cost categories shown in **Table R3-11**.

Work Plans and Mobilization

In the event that the operators of the project default on their obligations under the permit, it is assumed that the EPA and/or the State of Arizona would have the responsibility of completing closure and post-closure operations. The State would likely hire a remediation contractor to conduct the necessary closure and post-closure operations, using subcontractors where necessary to perform such services as rinsing, well abandonment, and pump replacement. It is also assumed that the contractor would have to prepare work plans, assemble a team and mobilize to the site to begin rinsing and closure operations. A lump sum estimate of $75,000 has been allocated for the preparation of work plans. An additional $20,000 has been allocated for mobilization and demobilization from the site.

Labor Costs

The process of rinsing the production wellfield and the pullback pumping is estimated to take three years. The rinsing is rested for a year to naturally neutralize the solution and the pullback pumping occurs throughout the three years. Therefore, three years of wellfield operation, maintenance, and general and administrative costs are included in the closure costs regardless of the mining year in Stage 1 that the mining operations cease.

The operation of the wellfield can be managed by a supervisor, two operators, an electrician and site security personnel during the rinsing and pullback pumping cycle. Hourly rates for wellfield rinsing staff are shown in Table R3-2 and unit costs are shown in Table R3-11 on Lines 58-62.

Table R3-2: Labor Hourly Costs

Position	Quantity	Hourly Rate
Project Manager	1	$125
Rinsing Supervisor	1	$72
Wellfield Operator	2	$56
Wellfield Electrician	1	$44
Site Security	1	$30
Overhead	10%	

Hourly rates were obtained by using R.S. Means conversions of local, published salaries for specific positions. Labor costs were developed by taking the rinsing duration in days and dividing them by 7 to determine number of weeks. The project manager was assigned 10 hours per week while the field personnel were assigned 40 hours per week and site security 60 hours per week. An overhead charge of 10% was applied to all labor rates to cover such things as vehicle use and administrative and field expenses.

Pump Replacement Costs

Before rinsing can begin, submersible pumps in the recovery wells need to be changed for similar pumps with a smaller discharge rate. Rinsing operations are limited by the supply of fresh water available at the Johnson Camp Mine (approximately 400 gpm), so it is impractical to rinse the wellfield at production-level injection rates. A subcontractor with well maintenance experience will be used to change the pumps.

During production, the recovery wells will typically be sized to pump approximately 80 gpm. During rinsing, the recovery pumping rates for rinsate will be typically 25% of that rate, or 20 gpm, requiring a change in the pumps to operate efficiently. Costs for pump replacement and well maintenance have been estimated on a contract basis using a quote from Verdad, Inc. in Tucson. The cost for a replacement pump for 20 gpm recovery is estimated at $2,990. Labor, rig costs, and per diem are estimated at 4 hours per well for rig and labor costs, and ½ day of per diem per well. A single mobilization charge of $1,500 is estimated for pump replacement. It was assumed that a new submersible well pump would be capable of recovering rinsate for the estimated 330 days of pumping required without significant maintenance costs.

Quarterly Reporting

As mentioned above, in the event that the operators of the project default on their obligations under the permit, it is assumed that the EPA and/or the State of Arizona would have the responsibility of completing closure and post-closure operations for purposes of calculating the closure bond. The remediation contractor will prepare quarterly reports. In any given year, the number of reports that it will take to complete rinsing will vary, depending on how many cells must be rinsed. For example, in Year 4, the duration of rinsing needed for existing wells is 676 days (Line 5 of Table R3-1) so there will be 8 quarterly reports prepared (Line 22).

Power Costs

The primary cost of rinsing is power. Power costs are based on the cost of power ($0.08/kWh) from Sulphur Springs Valley Electric Co-operative to the Johnson Camp Mine during recent operation before the mine went into care and maintenance. Unit power costs ($/Mgal) are discussed below for the following:

- Water Supply Pumping for Rinsing
- Rinse Recovery Pumping
- Hydraulic control Pumping
- Mechanical Evaporation

Water supply costs for rinsing are based on the existing wells at the Johnson Camp Mine and the estimated power cost to pump 400 gallons per minute (gpm) divided by the flow rate requirement to accomplish the rinsing. Water supply is provided by two 60 hp pumps capable of producing 400 gpm. The cost per gallon of water supply for rinsing is $0.0002685, or $268.45 per million gallons (/Mgal) as shown in Table R3-3.

Table R3-3: Power Cost for Fresh Water Supply Pumping for Rinsing

Description	Units	Quantity
Water Supply output	gpm	400
Conversion	gph	24,000
Water Supply Pump motors	hp	120
Conversion	kW/hp	0.746
Power Factor	%	90
Power usage	kW	80.5
Cost per kW-hr	$	0.080
Pumping Cost per hour	$	6.44
Water Supply Power Cost	$/gal	0.0002685
Water Supply Power Cost	$/Mgal	**$268.45**

Rinsate from the recovery wells is pumped up to the Gunnison Evaporation Pond. Maintenance for these pumps is included in wellfield maintenance. The rinse recovery pumping liability assumes a 5 hp motor capable of pumping 15 gpm per well against a total dynamic head of over 600 feet with a power cost of $0.08 per kilowatt-hour (kW-hr) to extract rinse water. The cost per gallon of rinse recovery pumping is $0.0002983, or $298.28/Mgal as shown in Table R3-4.

Table R3-4: Power Cost for Rinse Recovery Well Pumping

Description	Units	Quantity
Rinse Recovery Pumping	gpm	15
Conversion	gph	900
Recovery Pump motors	hp	5
Conversion	kW/hp	0.746
Power Factor	%	90
Power usage	kW	3.4
Cost per kW-hr	$	0.080
Pumping Cost per hour	$	0.27
Rinse Recovery Pumping Cost	$/gal	0.0002983
Rinse Recovery Pumping Cost	$/Mgal	**$298.28**

Hydraulic control wells are outfitted with 5 HP pumps. These pumps must be utilized throughout the rinsing process to ensure that hydraulic control is maintained to prevent excursions of impacted rinse solutions until the formations are adequately rinsed. Table R3-5 summarizes the power consumption and cost of power for hydraulic control wells during closure.

Table R3-5: Power Cost for Hydraulic Control Well Pumping

Description	Units	Quantity
Hydraulic Control Pumping	gpm	15
Conversion	gph	900
Recovery Pump motors	hp	5
Conversion	kW/hp	0.746
Power Factor	%	90
Power usage	kW	3.4
Cost per kW-hr	$	0.080
Pumping Cost per hour	$	0.27
Hydraulic Control Pumping Cost	$/gal	0.0002983
Hydraulic Control Pumping Cost	$/Mgal	**$298.28**

Power costs for mechanical evaporation of the rinsate are based on vendor information using climatic data for the Johnson Camp mine. The annual average evaporation required is 37.6 million gallons. The evaporator model that has been selected for purposes of this estimate is the Mega Polecat model from SMI Evaporative Systems. One operating evaporator and one standby evaporator are needed in Years 1 and 2. The number of evaporators reaches a maximum seven operating and one standby in Year 7. However, in full-scale rinsing during closure the available rinse water flow heading to evaporation will be 440 gpm, requiring 11 evaporators total. The capital cost for adding 9 evaporators (11 total) at $91,000 per evaporator (with controls, based on a quote from SMI Evaporative Solutions) is held constant throughout the closure cost estimate to provide for the additional units required during closure.

The capacity of one evaporator is 130 gpm with an average evaporation efficiency calculated from manufacturer's data of 55% for an evaporation rate of 71.5 gpm, or 4,290 gallons per hour. The fan motor and pump to supply water to the unit total 90 hp. The unit rate for evaporation is $0.001129 per gallon, or $1,126.83 per million gallons as shown in Table R3-6.

Table R3-6: Power Cost for Mechanical Evaporation

Description	Units	Quantity
Evaporation Rate	gpm	71.5
Conversion	gph	4,290
Fan Pump	hp	60
Feed Pump	hp	30
Conversion	kW/hp	0.746
Power Factor	%	90
Power usage (fan+pump)	kW	60.4
Cost per kW-hr	$	0.080
Evaporator Power Cost per hour	$/hr	4.83
Evaporation Power Cost	$/gal	0.0011268
Evaporation Power Cost	$/Mgal	**$1,126.83**

Wellfield Rinsing Credits

The process of closing production wells is scheduled to begin in Year 5 of production. The first step in well closure is early rinsing in which the leach solution is replaced with clean water to dilute the pore water in the formation approximately 95 percent. Geochemical studies (Attachment H-2) indicate that this will require injection of approximately three pore volumes of clean water. Once complete, the closure liability is reduced by the cost of that rinsing and is shown as a credit (Line 103 of Table R3-11 and Table R3-7). The early rinsing credit is calculated as three-fifths of the rinsing liability, since it takes three of the five pore volumes necessary to complete the rinsing.

The second step of rinsing involves shutting down the wellfield for approximately 200 days. Rinse water injection and rinsate recovery is stopped to allow the remaining solution to be neutralized by the formation. The natural acid neutralizing potential of the formation has been shown by metallurgical test work to bring the rinse water resting in the formation to near neutral pH in approximately 200 days. After the rest phase, the geochemical model indicates that only fluoride will exceed the AWQS/primary MCL.

Additional rinsing is conducted in step three to flush out constituents remaining in the formation after neutralization. Geochemical modeling indicates that an additional two pore volumes of rinse water needs to be injected and recovered to reduce all constituents (specifically fluoride—all others are expected to meet AWQSs and primary MCLs at the end of the rest phase) to AWQSs/MCLs. In the rinsing schedule this 200 days is approximated by one year. The rinsing credit for this late rinsing is the remaining two-fifths of the water supply, rinsate extraction pumping, rinsate pumping, and evaporation liability.

Table R3-7: Wellfield Rinsing Credits by Year

Category	Rate	Unit	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Early Rinse cells		5-Spot					14	9	8	7	9	8
Pore volume @ 3% porosity per cell	1.863	Mgal					26.077	16.764	14.901	13.039	16.764	14.901
Early Rinse volume	3 pore volumes	Mgal					78.231	50.292	44.704	39.116	50.292	44.704
Water Supply Power Credits	$268	$/Mgal					$21,001	$13,501	$12,001	$10,501	$13,501	$12,001
Rinse Recovery Pumping Power Credits	$298	$/Mgal					$23,335	$15,001	$13,334	$11,667	$15,001	$13,334
Early Rinsate Pumping Credits	$0	$/Mgal					$0	$0	$0	$0	$0	$0
Evaporation Power Credits	$1,127	$/Mgal					$88,153	$56,670	$50,373	$44,076	$56,670	$50,373
		Yearly Early Rinse Credits					$132,489	$85,172	$75,708	$66,245	$85,172	$75,708
Late Rinse Blocks		block							14	9	8	7
Pore volume @ 3% porosity per cell	1.863	Mgal							26.077	16.764	14.901	13.039
Late Rinse volume	2 pore volumes	Mgal							52.154	33.528	29.802	26.077
Water Supply Power Credits	$268	$/Mgal							$14,001	$9,001	$8,001	$7,000
Rinse Recovery Pumping Power Credits	$298	$/Mgal							$15,557	$10,001	$8,889	$7,778
Late Rinsate Pumping Credits	$0	$/Mgal							$0	$0	$0	$0
Evaporation Power Credits	$1,127	$/Mgal							$58,769	$37,780	$33,582	$29,384
		Yearly Late Rinse Credits					$0	$0	$88,326	$56,781	$50,472	$44,163
		Total Yearly Wellfield Rinsing Credits					**$132,489**	**$85,172**	**$164,034**	**$123,026**	**$135,644**	**$119,871**

Rinsing Verification Sampling

Rinsing verification consists of groundwater monitoring of injection/recovery wells after rinsing is completed. The cost was calculated for each year of Stage 1 (Years 1-10) based on the number of injection and recovery wells in existence during that year (Table R3-8). The following assumptions were made:

- Labor costs are based on Clear Creek Associates' Staff 1 billing rate, which is the appropriate staffing level for this task.
- After rinsing of Block 1, 100% of extraction wells (24 wells per Attachment A-1 Section 3.2.8.1) will be sampled for rinse verification. For subsequent blocks, 10% of extraction wells will be monitored for rinse verification, if it can be shown that 10% is representative of the overall groundwater quality within the block (based on the Block 1 results).
- Current pricing from Turner Laboratories in Tucson, AZ was used to calculate analytical laboratory costs.
- No purging is required as the wells will be sampled at the end of rinsing steps so they will already be purged.
- Assumed 1.5 hours of collection time per sample.

Sampling of 10% of the recovery wells is justifiable based on the spacing and number of wells. The entire wellfield is approximately 192 acres. During the life of the project there will be approximately 1,400 injection/recovery wells operating within the wellfield. Sampling 10% of the wells equates to one well for every 0.73 acres. The dimensions of a 1.4-acre square block are less than 250 feet by 250 feet. Excelsior considers this to be a high sample density that will adequately characterize the effectiveness of rinsing. A sample size of 10% is typically considered statistically significant for quality assurance (QA) verification by ADEQ and other governmental agencies.

Table R3-8: Worksheet used to Calculate Rinsing Verification Unit Costs

				YEAR									
				Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Description	**Qty**	**Rate**	**Unit**	**24**	**4**	**5**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Sample collection (1 hours per sample--no purging required)	1.5	$95.00	hr	$ 3,420	$ 570	$ 713	$ 855	$ 855	$ 855	$ 855	$ 855	$ 855	$ 855
Field Parameters Meter (Clear Creek Rate)	2	$25.00	day	$ 50	$ 50	$ 50	$ 50	$ 50	$ 50	$ 50	$ 50	$ 50	$ 50
Misc. field costs per well (2)	1	$25.00	each	$ 600	$ 100	$ 125	$ 150	$ 150	$ 150	$ 150	$ 150	$ 150	$ 150
Mileage (from Tucson) based on 2 trips per year	280	$0.55	each	$ 154	$ 154	$ 154	$ 154	$ 154	$ 154	$ 154	$ 154	$ 154	$ 154
Field Truck (Clear Creek Rate)	2	$95.00	daily	$ 190	$ 190	$ 190	$ 190	$ 190	$ 190	$ 190	$ 190	$ 190	$ 190
Generator Rental (trailer mounted, from Sunstate Rentals)(3)	1	$713.00	week	$ 713	$ 713	$ 713	$ 713	$ 713	$ 713	$ 713	$ 713	$ 713	$ 713
Laboratory Costs (TURNER)(1)													
Dissolved Metals ICP (Sb, As, Ba, Be, Cd, Cr, Pb, Se, Th, Ni)	1	$80.00	sample	$ 1,920	$ 320	$ 400	$ 480	$ 480	$ 480	$ 480	$ 480	$ 480	$ 480
Mercury dissolved	1	$41.00	sample	$ 984	$ 164	$ 205	$ 246	$ 246	$ 246	$ 246	$ 246	$ 246	$ 246
Fluoride	1	$20.00	sample	$ 480	$ 80	$ 100	$ 120	$ 120	$ 120	$ 120	$ 120	$ 120	$ 120
VOCs	1	$150.00	sample	$ 3,600	$ 600	$ 750	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900
TDS	1	$21.00	sample	$ 504	$ 84	$ 105	$ 126	$ 126	$ 126	$ 126	$ 126	$ 126	$ 126
pH --field	1	$0.00	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
nitrate+nitrite	1	$30.00	sample	$ 720	$ 120	$ 150	$ 180	$ 180	$ 180	$ 180	$ 180	$ 180	$ 180
dissolved U	1	$150.00	sample	$ 3,600	$ 600	$ 750	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900	$ 900
Ra226 + Ra 228	1	$195.00	sample	$ 4,680	$ 780	$ 975	$ 1,170	$ 1,170	$ 1,170	$ 1,170	$ 1,170	$ 1,170	$ 1,170
gross alpha	1	$85.00	sample	$ 2,040	$ 340	$ 425	$ 510	$ 510	$ 510	$ 510	$ 510	$ 510	$ 510
Data Management, Reporting per sample	2	$95.00	hr	$ 4,560	$ 760	$ 950	$ 1,140	$ 1,140	$ 1,140	$ 1,140	$ 1,140	$ 1,140	$ 1,140
Annual Cost				**$ 28,215**	**$ 5,625**	**$ 6,755**	**$ 7,884**	**$ 7,884**	**$ 7,884**	**$ 7,884**	**$ 7,884**	**$ 7,884**	**$ 7,884**
Unit Cost per Sample				**$ 1,176**	**$ 1,406**	**$ 1,351**	**$ 1,314**	**$ 1,314**	**$ 1,314**	**$ 1,314**	**$ 1,314**	**$ 1,314**	**$ 1,314**
Notes:													
(1) Unit Costs from Turner Laboratories in Tucson, AZ													
(2) Ice, disposables, fuel for generator.													
(3) weekly unit rate is marked up by 15%. Rate from SunState													

The annual costs were divided by the number of samples per year to arrive at a unit cost (Table R3-8). The highest unit cost is in Year 1 ($1,406 per sample in Year 2). This unit cost was used each year to calculate the closure costs for each year.

Well Abandonment Costs

Clear Creek obtained unit costs from three licensed drilling companies in Arizona to compile well abandonment costs. Unit costs (i.e. cost per well to abandon) were calculated for the different types of wells: injection/recovery, hydraulic control, point of compliance, observation, and Intermediate Monitor wells (IMWs). Unit costs for abandonment of each well type are based on the well depth and diameter (volume of grout needed), and whether or not perforation will be required. Injection and recovery wells and hydraulic control wells will be open hole completion so the abandonment costs are relatively low because perforation is not necessary. Observation wells, point of compliance wells and the IMWs with screen and annular materials will be more expensive to abandon because they will require perforation. The average depth of wells in this portion of the mineralization is expected to be approximately 1,435 feet below land surface, so a depth of 1450 feet was used to calculate the well abandonment costs using third party unit costs provided by Yellow Jacket Drilling, a licensed well driller in Arizona.

Table R3-9 below provides a summary of year-by-year abandonment costs for all wells in existence during each year of Stage 1 operations. Table R3-10 (provided at the end of this text) provides detailed post closure monitoring costs.

Table R3-9: Year-By-Year Well Abandonment Cost Summary

	Wellfield		HC Wells		Obs Wells		IMWs		RVWs		
Year	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	TOTAL
Y1	38	$ 648,660	3	$ 30,900	2	$ 83,240	31	$ 329,220	0	$ -	$ 1,092,020
Y2	58	$ 970,660	5	$ 51,500	4	$ 166,480	29	$ 307,980	0	$ -	$ 1,496,620
Y3	78	$ 1,249,760	5	$ 51,500	4	$ 166,480	27	$ 286,740	0	$ -	$ 1,754,480
Y4	95	$ 1,562,600	6	$ 61,800	6	$ 249,720	26	$ 276,120	0	$ -	$ 2,150,240
Y5	116	$ 1,899,920	9	$ 92,700	6	$ 250,020	26	$ 276,120	0	$ -	$ 2,518,760
Y6	132	$ 2,156,240	11	$ 113,300	8	$ 332,960	26	$ 276,120	0	$ -	$ 2,878,620
Y7	150	$ 2,445,200	19	$ 195,700	14	$ 582,380	26	$ 276,120	0	$ -	$ 3,499,400
Y8	150	$ 2,442,200	19	$ 195,700	14	$ 582,380	25	$ 265,500	4	$ 64,600	$ 3,550,380
Y9	148	$ 2,410,160	19	$ 195,700	14	$ 582,380	25	$ 265,500	6	$ 102,000	$ 3,555,740
Y10	152	$ 2,468,240	19	$ 195,700	14	$ 582,380	23	$ 244,260	8	$ 136,000	$ 3,626,580

Abandonment costs are provided for wells, including injection/recovery wells, observation wells, hydraulic control wells, and the IMWs. NOTE: The POC wells will be installed for the purposes of the APP and the bonding for abandonment will be held by ADEQ.

Assumptions used in calculating abandonment costs are provided at the bottom of the spreadsheet and are linked to the appropriate line items. Some of the key assumptions are:

1. Average total depth of wells is 1450 feet.
2. Average of 1150 feet of grout will be used to abandon each well to meet ADWR/UIC requirements for the grouted interval.
3. Injection/recovery wells will be open hole completion with a 7-inch diameter borehole.
4. Hydraulic control wells will be open hole completion with a 5-inch diameter borehole.
5. Observation and some of the IMW wells will be constructed with screen and annular materials. Perforation costs are included for these wells.
6. One mobilization is included for all wells (excluding the POC wells)
7. Consultant labor rates are based on Clear Creek Associates' billing rates, which are consistent with the industry standard in Arizona.

The highest year for well abandonment in Stage 1 is Year 10, with a total cost of approximately 3.63 million.

Post-Closure Monitoring

The post-closure monitoring will comprise 5 years of annual monitoring at three POC wells 8 outer Observation Wells and within the wellfield at Closure Verification Wells (CVWs). The wellfield will be considered closed when five consecutive annual rounds of monitoring at the CVWs outer OWs and the POCs meet AWQSs and MCLs. While this monitoring is scheduled to take place over 5 years at the end of mining, the total cost is included for Years 1 to 10 in the event of premature cessation of operations. Costs for 5 years of post-closure monitoring are estimated to be $236,548. as shown in Table R3-10:

Table R3-10: Cost for Five Years of Post-Closure Monitoring

	Quantity	Rate	Unit	markup %	Total	NOTE
Sample collection (8 hours per sample, 95 samples)	760	$95.00	hr	0	$72,200.00	(2)(3)
Field Parameters Meter	95	$25.00	day		$2,375.00	
Misc. field costs--5 events	5	$500.00	lumpsum		$2,500.00	(5)
Mileage (from Tucson) (90 days at 140 miles per day)	12600	$0.55	mile		$6,930.00	(8)
Field Truck	95	$95.00	daily		$9,025.00	
Generator Rental (trailer mounted, from Sunstate Rentals)	15	$713.00	week	15	$12,299.25	(7)
Laboratory Costs						
Dissolved Metals ICP (Sb, As, Ba, Be, Cd, Cr, Pb, Se, Th, Ni)	105	$80.00	sample	15	$9,660.00	(1) (4)
Mercury dissolved	105	$41.00	sample	15	$4,950.75	(1) (4)
Fluoride	105	$20.00	sample	15	$2,415.00	(1) (4)
VOCs	105	$150.00	sample	15	$18,112.50	(1) (4)
TDS	105	$21.00	sample	15	$2,535.75	(1) (4)
pH --field	105	$0.00	sample	0	$0.00	(1) (4)
nitrate+nitrite	105	$30.00	sample	15	$3,622.50	(1) (4)
dissolved U	105	$150.00	sample	15	$18,112.50	(1) (4)
Ra226 + Ra 228	105	$195.00	sample	15	$23,546.25	(1) (4)
gross alpha	105	$85.00	sample	15	$10,263.75	(1) (4)
Data Management, Reporting, 5 annual reports	400	$95.00	hr		$38,000.00	
POC well plugging and abandonment						(6)
Oversight for well plugging and abandonment (5 POC wells)						(6)
Post-Closure Costs Total					**$236,548.25**	
NOTES:				Yearly average	**$47,309.65**	

This is for 5 years post closure monitoring starting at end of Stage 1 (Year 10)

Assumptions

(1)Total of 105 samples will be collected. ((3 POC wells+ 8 Closure Verification Wells+8 outer OWs) x (5 annual events) + (10 Duplicates))= 105 samples
(2) 95 samples x 8 hours/sample = 440 hours
(3) Duplicates not included in sampling time.
(4) Unit Costs from Turner Laboratories in Tucson, AZ
(5) Ice, disposables, fuel for generator.
(6) Included in well abandonment spreadsheet
(7) weekly unit rate is marked up by 15%. Rate from SunState

Cumulative Closure Liability

The final row in Table R3-1 shows the cumulative wellfield liability with deductions for closure expenses projected to have been accrued to that point on a year-by-year basis. The closure liability for Stage 1 production peaks in Year 10 at $8.55 million. Without taking credit for scheduled closure items, the maximum closure liability is $8.67 million, also occurring in Year 10. These closure costs are the same as those provided to the Arizona Department of Environmental Quality (ADEQ) for the Aquifer Protection Permit (APP) except that the APP closure costs also include closure costs for impoundments and POC wells.

References

M3 Engineering & Technology Corp., 2014. Gunnison Copper Project, N143-1 01 Technical Report, Prefeasibility Study, Cochise County, Arizona, USA. February 14, 2014.

December 2016 Attachment R-3
by M-3 Engineering

March, May and July 2017 Revisions
by Axelrod, Inc.

TABLE R3-11
CLOSURE COST DETAIL

LINE	Closure Costs	Unit	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
2	Mining Block Area	ft^2	140,000	90,000	80,000	70,000	90,000	80,000	80,000	90,000	60,000	80,000
3	Rinsing Volume (5 pore volumes)	Mgal	130.4	83.8	74.5	65.2	83.8	74.5	74.5	83.8	55.9	74.5
4	Cumulative Rinsing Volume	Mgal	130.4	214.2	288.7	353.9	359.5	383.7	361.4	372.5	348.3	352.0
5	Duration of Rinsing @ 400 gpm	days	249	409	551	676	687	733	690	711	665	672
6	Pullback Pumping Volume	Mgal	513	448	384	319	255	255	255	255	255	255
7			Quantities									
8	**Prepare Work Plans**	lump sum	1	1	1	1	1	1	1	1	1	1
9	**Mobilization**	lump sum	1	1	1	1	1	1	1	1	1	1
10	**Labor**											
11	Project Manager	hour	356	584	788	966	981	1,047	986	1,016	950	960
12	Wellfield Supervisor	hour	1,423	2,338	3,151	3,862	3,923	4,187	3,943	4,065	3,801	3,842
13	Wellfield Operators (2)	hour	2,846	4,675	6,301	7,724	7,846	8,375	7,887	8,131	7,602	7,683
14	Wellfield Electrician	hour	1,423	2,338	3,151	3,862	3,923	4,187	3,943	4,065	3,801	3,842
15	Site Security	hour	2,134	3,506	4,726	5,793	5,885	6,281	5,915	6,098	5,702	5,763
16												
17	**Changing Pumps**											
18	Recovery Wells		24	35	47	57	56	53	53	51	51	54
19	Mobilization	lump sum	1	2	2	2	2	2	2	2	2	2
20	Service Rig and Crew (2)	hour	96	140	188	228	224	212	212	204	204	216
21	Per diem	day	12	17.5	23.5	28.5	28	26.5	26.5	25.5	25.5	27
22												
23	**Quarterly Reporting**	quarter	3	5	7	8	8	9	8	8	8	8
24												
25	**Volumes for Power Costs**											
26	Water Supply	Mgal	130	214	289	354	359	384	361	373	348	352
27	Rinse Recovery Pumping	Mgal	130	214	289	354	359	384	361	373	348	352
28	Early Rinsate Pumping	Mgal	78	129	173	212	216	230	217	224	209	211
29	Late Rinsate Pumping	Mgal	52	86	115	142	144	153	145	149	139	141
30	Pullback Pumping	Mgal	513	448	384	319	255	255	255	255	255	255
31	Evaporation Volume Rinsate	Mgal	130	214	289	354	359	384	361	373	348	352
32	Evaporation Volume Pullback	Mgal	513	448	384	319	255	255	255	255	255	255
33	Hydraulic Control Pumping (4 yrs)	Mgal	50	56	61	67	73	73	73	73	73	73
34												
35	**Rinsing Verification Sampling**	sample	24	4	5	6	6	6	6	6	6	6
36												
37	**Pond Closure**											
38	Evaporation Pond Closure	each	1	1	1	1	1	1	1	1	1	1
39	Evaporation Pond Post Closure	each	1	1	1	1	1	1	1	1	1	1
40	Pipeline Drain Pond Closure	each	1	1	1	1	1	1	1	1	1	1
41	Pipeline Drain Pond Post Closure	each	1	1	1	1	1	1	1	1	1	1
42												
43	**Well Abandonment**											
44	Wellfield	each	38	58	78	95	116	132	150	150	148	152
45	HC wells	each	3	5	5	6	9	11	19	19	19	19
46	Observation wells	each	2	4	4	6	6	8	14	14	14	14
47	POC wells	each	3	3	3	3	3	3	3	3	3	3
48	IMW	each	31	29	27	26	26	26	26	25	25	23
49	Rinse Verification wells	each	0	0	0	0	0	0	0	4	6	8
50												
51	**Post Closure Monitoring (3 POCs, 8 RVWs, 5 years)**	Sample rounds	5	5	5	5	5	5	5	5	5	5
52												
53												

TABLE R3-11
CLOSURE COST DETAIL

LINE	Closure Costs	Unit	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
54			Estimated Costs									
55	**Prepare Work Plans**	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
56	**Mobilization**	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
57	**Labor**											
58	Project Manager	$125	$44,464	$73,048	$98,457	$120,689	$122,594	$130,852	$123,230	$127,041	$118,783	$120,054
59	Wellfield Supervisor	$72	$102,446	$168,304	$226,844	$278,067	$282,457	$301,483	$283,921	$292,702	$273,676	$276,603
60	Wellfield Operators (2)	$56	$159,360	$261,806	$352,869	$432,549	$439,378	$468,974	$441,655	$455,314	$425,719	$430,272
61	Wellfield Electrician	$44	$62,606	$102,852	$138,627	$169,930	$172,613	$184,240	$173,507	$178,873	$167,247	$169,035
62	Site Security	$30	$64,029	$105,190	$141,778	$173,792	$176,536	$188,427	$177,451	$182,939	$171,048	$172,877
63	Overhead, Vehicles, & Expenses	10%	$43,290	$71,120	$95,857	$117,503	$119,358	$127,398	$119,976	$123,687	$115,647	$116,884
64	Labor for pullback pumping	$	$1,235,039	$1,001,358	$793,641	$611,889	$596,310	$528,802	$591,117	$559,959	$627,467	$617,082
65												
66	**Changing Pumps**											
67	Capital Cost for pump replacements	$2,990	$71,760	$104,650	$140,530	$170,430	$167,440	$158,470	$158,470	$152,490	$152,490	$161,460
68	Mobilization	$1,500	$1,500	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
69	Service Rig and Crew (2)	$180	$17,280	$25,200	$33,840	$41,040	$40,320	$38,160	$38,160	$36,720	$36,720	$38,880
70	Per diem	$350	$4,200	$6,125	$8,225	$9,975	$9,800	$9,275	$9,275	$8,925	$8,925	$9,450
71												
72												
73	**Quarterly Reporting**	$1,620	$4,860	$8,100	$11,340	$12,960	$12,960	$14,580	$12,960	$12,960	$12,960	$12,960
74												
75	**Rinsing, Pullback, Capital & Power Costs**											
76	Mechanical Evaporator Capital (9 units)	91,000	$819,000	$819,000	$819,000	$819,000	$819,000	$819,000	$819,000	$819,000	$819,000	$819,000
77	Water Supply Power	$268	$35,002	$57,504	$77,505	$95,006	$96,506	$103,007	$97,006	$100,006	$93,506	$94,506
78	Rinse Recovery Pumping Power	$298	$38,891	$63,893	$86,117	$105,562	$107,229	$114,452	$107,785	$111,118	$103,896	$105,007
81	Pullback Pumping Power	$72	$36,723	$32,105	$27,486	$22,867	$18,249	$18,249	$18,249	$18,249	$18,249	$18,249
82	Evaporation Power	$1,127	$146,922	$241,371	$325,326	$398,787	$405,084	$432,369	$407,183	$419,776	$392,491	$396,688
83	Hydraulic Control Pumping Power (4 yrs)	$298	$14,894	$16,579	$18,264	$19,950	$21,635	$21,635	$21,635	$21,635	$21,635	$21,635
84	Evaporation Power Pullback	$1,127	$578,045	$505,345	$432,645	$359,946	$287,246	$287,246	$287,246	$287,246	$287,246	$287,246
85												
86	**Rinsing Verification Sampling**	$1,350	$32,400	$5,400	$6,750	$8,100	$8,100	$8,100	$8,100	$8,100	$8,100	$8,100
87												
88	**Maintenance: Evaporators, Pumps, Rigs**		$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
89												
90	**Well Abandonment**											
91	Wellfield	$16,448	$648,660	$970,660	$1,249,760	$1,562,600	$1,899,920	$2,156,240	$2,445,200	$2,442,200	$2,410,160	$2,468,240
92	HC wells	$10,300	$30,900	$51,500	$51,500	$61,800	$92,700	$113,300	$195,700	$195,700	$195,700	$195,700
93	Observation wells	$41,620	$83,240	$166,480	$166,480	$249,720	$249,720	$332,960	$582,680	$582,680	$582,680	$582,680
94	POC wells (bonded in with ADEQ for APP)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
95	IMW closure	$10,600	$328,600	$307,400	$286,200	$275,600	$275,600	$275,600	$275,600	$265,000	$265,000	$243,800
96	RVW Closure	$17,000	$0	$0	$0	$0	$0	$0	$0	$68,000	$102,000	$136,000
97												
98	**Post Closure Monitoring (3 POCs, 8 RVWs, 5 years)**	$47,310	$236,548	$236,548	$236,548	$236,548	$236,548	$236,548	$236,548	$236,548	$236,548	$236,548
99												
100	Subtotal of Closure Liability by Year of Shutdown		$4,985,659	$5,549,538	$5,973,589	$6,502,309	$6,805,304	$7,217,366	$7,779,653	$7,854,869	$7,794,893	$7,886,956
101	Contingency for Unanticipated Costs	10%	$498,566	$554,954	$597,359	$650,231	$680,530	$721,737	$777,965	$785,487	$779,489	$788,696
102	**Closure Liability by Year of Shutdown**		$5,484,225	$6,104,491	$6,570,948	$7,152,540	$7,485,834	$7,939,102	$8,557,618	$8,640,356	$8,574,382	$8,675,652
103	Less Rinsing Credits		$0	$0	$0	$0	-$132,489	-$85,172	-$164,034	-$123,026	-$135,644	-$119,871
104	**Net Closure Liability by Year of Shutdown**		$5,484,225	$6,104,491	$6,570,948	$7,152,540	$7,353,345	$7,853,930	$8,393,584	$8,517,331	$8,438,738	$8,555,781

WELLFIELD INJECTION/RECOVERY WELLS			Y1		Y2		Y3		Y4		Y5		Y6		Y7		Y8		Y9		Y10	
Injection Wells in Production				$ 14		$ 23		$ 31		$ 38		$ 33		$ 32		$ 32		$ 34		$ 33		$ 33
Recovery Wells in Production				$ 24		$ 35		$ 47		$ 57		$ 56		$ 53		$ 53		$ 51		$ 51		$ 54
Injection Wells in Rinsing				$ -		$ -		$ -		$ -		$ 14		$ 23		$ 31		$ 24		$ 24		$ 24
Recovery Wells in Rinsing				$ -		$ -		$ -		$ -		$ 13		$ 24		$ 34		$ 36		$ 35		$ 30
Dormant Wells				$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ 5		$ 5		$ 11
Total existing Injection/Recovery Wells				$ 38		$ 58		$ 78		$ 95		$ 116		$ 132		$ 150		$ 150		$ 148		$ 152
	Unit cost		**Quantity**		**Quantity**		**Quantity**		**Quantity**		**Quantity**		**Quantity**		**Quantity**		**Quantity**		**Quantity**		**Quantity**	
Mobilization and Demobilization (1)	$ 10,000.00	lump sum	1	$ 10,000	1	$ 10,000	1	$ 10,000	1	$ 10,000	1	$ 10,000	1	$ 10,000	1	$ 10,000	1	$ 10,000	1	$ 10,000	1	$ 10,000
ADWR Closure Notification	$ 150.00	each	38	$ 5,700	58	$ 8,700	78	$ 11,700	95	$ 14,250	116	$ 17,400	132	$ 19,800	150	$ 22,500	150	$ 22,500	148	$ 22,200	152	$ 22,800
Pump Removal (1)	$ 1,200.00	each	24	$ 28,800	35	$ 42,000	47	$ 16,800	57	$ 68,400	69	$ 82,800	77	$ 92,400	87	$ 104,400	87	$ 104,400	86	$ 103,200	84	$ 100,800
Injection Well Port Removal (1)	$ 600.00	each	14	$ 8,400	23	$ 13,800	31	$ 18,600	38	$ 22,800	47	$ 28,200	55	$ 33,000	63	$ 37,800	58	$ 34,800	57	$ 34,200	57	$ 34,200
Perforation of Well Casing (2)	$ 25.00	ft	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
Abandonment of Boring with Type V Cement (1)(9)(10)	$ 12.00	ft	43700	$ 524,400	66700	$ 800,400	89700	$ 1,076,400	109250	$ 1,311,000	133400	$ 1,600,800	151800	$ 1,821,600	172500	$ 2,070,000	172500	$ 2,070,000	170200	$ 2,042,400	174800	$ 2,097,600
Removal of casing 2 feet below grade (1)	$ 150.00	each	38	$ 5,700	58	$ 8,700	78	$ 11,700	95	$ 14,250	116	$ 17,400	132	$ 19,800	150	$ 22,500	150	$ 22,500	148	$ 22,200	152	$ 22,800
Disposal of Construction Debris (1) (6)	$ 25,000.00	lump sum	1	$ 25,000	1	$ 25,000	1	$ 25,000	1	$ 25,000	1	$ 25,000	1	$ 25,000	1	$ 25,000	1	$ 25,000	1	$ 25,000	1	$ 25,000
Oversight of well abandonments by Consultant (13)	$ 75.00	hr	380	$ 28,500	580	$ 43,500	780	$ 58,500	950	$ 71,250	1160	$ 87,000	1320	$ 99,000	1500	$ 112,500	1500	$ 112,500	1480	$ 111,000	1520	$ 114,000
Project management by Consultant (14)	$ 125.00	hr	38	$ 4,750	58	$ 7,250	78	$ 5,850	95	$ 7,125	116	$ 8,700	132	$ 9,900	150	$ 11,250	150	$ 11,250	148	$ 11,100	152	$ 11,400
Per Diem Consultant (15)	$ 195.00	each	38	$ 7,410	58	$ 11,310	78	$ 15,210	95	$ 18,525	116	$ 22,620	132	$ 25,740	150	$ 29,250	150	$ 29,250	148	$ 28,860	152	$ 29,640
				$ 648,660		$ 970,660		$ 1,249,760		$ 1,562,600		$ 1,899,920		$ 2,156,240		$ 2,445,200		$ 2,442,200		$ 2,410,160		$ 2,468,240
	average cost per well			$ 17,070		$ 16,736		$ 16,023		$ 16,448		$ 16,379		$ 16,335		$ 16,301		$ 16,281		$ 16,285		$ 16,238

HYDRAULIC CONTROL WELLS			Y1		Y2		Y3		Y4		Y5		Y6		Y7		Y8		Y9		Y10	
			3		5		5		6		9		11		19		19		19		19	
	Unit Cost		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity	
Mobilization and Demobilization (3)	$ 10,000.00	lump sum	0		0		0		0		0	$ -	0		0		0		0		0	
ADWR Closure Notification	$ 150.00	each	3	$ 450	5	$ 750	5	$ 750	6	$ 900	9	$ 1,350	11	$ 1,650	19	$ 2,850	19	$ 2,850	19	$ 2,850	19	$ 2,850
Pump Removal (1)	$ 1,200.00	each	3	$ 3,600	5	$ 6,000	5	$ 6,000	6	$ 7,200	9	$ 10,800	11	$ 13,200	19	$ 22,800	19	$ 22,800	19	$ 22,800	19	$ 22,800
Perforation of Well Casing (2)	$ 25.00	ft	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
Abandonment of Boring with Type V Cement (9)(11)	$ 7.00	ft	3450	$ 24,150	5750	$ 40,250	5750	$ 40,250	6900	$ 48,300	10350	$ 72,450	12650	$ 88,550	21850	$ 152,950	21850	$ 152,950	21850	$ 152,950	21850	$ 152,950
Removal of casing 2 feet below grade (1)	$ 150.00	each	3	$ 450	5	$ 750	5	$ 750	6	$ 900	9	$ 1,350	11	$ 1,650	19	$ 2,850	19	$ 2,850	19	$ 2,850	19	$ 2,850
Disposal of Construction Debris (1) (6)	$ 25,000.00	lump sum		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -
Oversight of well abandonments by Consultant (13)	$ 75.00	hr	30	$ 2,250	50	$ 3,750	50	$ 3,750	60	$ 4,500	90	$ 6,750	110	$ 8,250	190	$ 14,250	190	$ 14,250	190	$ 14,250	190	$ 14,250
Project management by Consultant (14)	$ 125.00	hr	3	$ 375	5	$ 625	5	$ 625	6	$ 750	9	$ 1,125	11	$ 1,375	19	$ 2,375	19	$ 2,375	19	$ 2,375	19	$ 2,375
Per Diem Consultant (15)	$ 195.00	each	3	$ 585	5	$ 975	5	$ 975	6	$ 1,170	9	$ 1,755	11	$ 2,145	19	$ 3,705	19	$ 3,705	19	$ 3,705	19	$ 3,705
				$ 30,900		$ 51,500		$ 51,500		$ 61,800		$ 92,700		$ 113,300		$ 195,700		$ 195,700		$ 195,700		$ 195,700
	avg cost per well			$ 10,300		$ 10,300		$ 10,300		$ 10,300		$ 10,300		$ 10,300		$ 10,300		$ 10,300		$ 10,300		$ 10,300

OBSERVATION WELLS			Y1		Y2		Y3		Y4		Y5		Y6		Y7		Y8		Y9		Y10	
			2		4		4		6		6		8		14		14		14		14	
	Unit cost		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity	
Mobilization and Demobilization (3)	$ 10,000.00	lump sum	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
ADWR Closure Notification	$ 150.00	each	2	$ 300	4	$ 600	4	$ 600	6	$ 900	8	$ 1,200	8	$ 1,200	12	$ 1,800	12	$ 1,800	12	$ 1,800	12	$ 1,800
Pump Removal (7)	$ 1,200.00	each	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
Perforation of Well Casing (1) (8)	$ 25.00	ft	2300	$ 57,500	4600	$ 115,000	4600	$ 115,000	6900	$ 172,500	6900	$ 172,500	9200	$ 230,000	16100	$ 402,500	16100	$ 402,500	16100	$ 402,500	16100	$ 402,500
Abandonment of Boring with Type V Cement (5)(9)(12)	$ 10.00	ft	2300	$ 23,000	4600	$ 46,000	4600	$ 46,000	6900	$ 69,000	6900	$ 69,000	9200	$ 92,000	16100	$ 161,000	16100	$ 161,000	16100	$ 161,000	16100	$ 161,000
Removal of casing 2 feet below grade (1)	$ 150.00	each	2	$ 300	4	$ 600	4	$ 600	6	$ 900	6	$ 900	8	$ 1,200	14	$ 2,100	14	$ 2,100	14	$ 2,100	14	$ 2,100
Disposal of Construction Debris (1) (6)	$ 25,000.00	lump sum		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -
Oversight of well abandonments by Consultant (13)	$ 75.00	hr	20	$ 1,500	40	$ 3,000	40	$ 3,000	60	$ 4,500	60	$ 4,500	80	$ 6,000	140	$ 10,500	140	$ 10,500	140	$ 10,500	140	$ 10,500
Project management by Consultant (14)	$ 125.00	hr	2	$ 250	4	$ 500	4	$ 500	6	$ 750	6	$ 750	8	$ 1,000	14	$ 1,750	14	$ 1,750	14	$ 1,750	14	$ 1,750
Per Diem Consultant (15)	$ 195.00	each	2	$ 390	4	$ 780	4	$ 780	6	$ 1,170	6	$ 1,170	8	$ 1,560	14	$ 2,730	14	$ 2,730	14	$ 2,730	14	$ 2,730
				$ 83,240		$ 166,480		$ 166,480		$ 249,720		$ 250,020		$ 332,960		$ 582,380		$ 582,380		$ 582,380		$ 582,380
	average cost per well			$ 41,620		$ 41,620		$ 41,620		$ 41,620		$ 41,670		$ 41,620		$ 41,599		$ 41,599		$ 41,599		$ 41,599

Intermediate Monitoring wells(19)			31		29		27		26		26		26		26		25		25		23	
	Unit Cost		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity		Quantity	
Mobilization and Demobilization (3)	$ 10,000.00	lump sum	0		0		0		0		0	$ -	0		0		0		0		0	
ADWR Closure Notification	$ 150.00	each	31	$ 4,650	29	$ 4,350	27	$ 4,050	26	$ 3,900	26	$ 3,900	26	$ 3,900	26	$ 3,900	25	$ 3,750	25	$ 3,750	23	$ 3,450
Pump Removal (1)	$ 1,200.00	each	31	$ 37,200	29	$ 34,800	27	$ 32,400	26	$ 31,200	26	$ 31,200	26	$ 31,200	26	$ 31,200	25	$ 30,000	25	$ 30,000	23	$ 27,600
Perforation of Well Casing (2)	$ 25.00	ft	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
Abandonment of Boring with Type V Cement (9)(11)	$ 7.00	ft	35650	$ 249,550	33350	$ 233,450	31050	$ 217,350	29900	$ 209,300	29900	$ 209,300	29900	$ 209,300	29900	$ 209,300	28750	$ 201,250	28750	$ 201,250	26450	$ 185,150
Removal of casing 2 feet below grade (1)	$ 150.00	each	31	$ 4,650	29	$ 4,350	27	$ 4,050	26	$ 3,900	26	$ 3,900	26	$ 3,900	26	$ 3,900	25	$ 3,750	25	$ 3,750	23	$ 3,450
Disposal of Construction Debris (1) (6)	$ 25,000.00	lump sum		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -
Oversight of well abandonments by Consultant (13)	$ 75.00	hr	310	$ 23,250	290	$ 21,750	270	$ 20,250	260	$ 19,500	260	$ 19,500	260	$ 19,500	260	$ 19,500	250	$ 18,750	250	$ 18,750	230	$ 17,250
Project management by Consultant (14)	$ 125.00	hr	31	$ 3,875	29	$ 3,625	27	$ 3,375	26	$ 3,250	26	$ 3,250	26	$ 3,250	26	$ 3,250	25	$ 3,125	25	$ 3,125	23	$ 2,875
Per Diem Consultant (15)	$ 195.00	each	31	$ 6,045	29	$ 5,655	27	$ 5,265	26	$ 5,070	26	$ 5,070	26	$ 5,070	26	$ 5,070	25	$ 4,875	25	$ 4,875	23	$ 4,485
				$ 329,220		$ 307,980		$ 286,740		$ 276,120		$ 276,120		$ 276,120		$ 276,120		$ 265,500		$ 265,500		$ 244,260
	avg cost per well			$ 10,620		$ 10,620		$ 10,620		$ 10,620		$ 10,620		$ 10,620		$ 10,620		$ 10,620		$ 10,620		$ 10,620
Rinse Verificaton wells Quantity (Recovery wells left open until end of LOM) (20)(21)			0		0		0		0		0		0		0		4		6		8	
Cost per well(20)				$ 17,000		$ 17,000		$ 17,000		$ 17,000		$ 17,000		$ 17,000		$ 17,000		$ 17,000		$ 17,000		$ 17,000
total liability for RVW abandonment				$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ 64,600.00		$ 102,000.00		$ 136,000.00
Abandonment Costs by year--Summary				**Y1**		**Y2**		**Y3**		**Y4**		**Y5**		**Y6**		**Y7**		**Y8**		**Y9**		**Y10**
Wellfield				$ 648,660		$ 970,660		$ 1,249,760		$ 1,562,600		$ 1,899,920		$ 2,156,240		$ 2,445,200		$ 2,442,200		$ 2,410,160		$ 2,468,240
HC wells				$ 30,900		$ 51,500		$ 51,500		$ 61,800		$ 92,700		$ 113,300		$ 195,700		$ 195,700		$ 195,700		$ 195,700
Observation wells				$ 83,240		$ 166,480		$ 166,480		$ 249,720		$ 250,020		$ 332,960		$ 582,380		$ 582,380		$ 582,380		$ 582,380
IMW Wells				$ 329,220		$ 307,980		$ 286,740		$ 276,120		$ 276,120		$ 276,120		$ 276,120		$ 265,500		$ 265,500		$ 244,260
Rinse Verification Wells/Closure Verification Wells				$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ 64,600		$ 102,000		$ 136,000
TOTAL ABANDONMENT COST-all well types				$ 1,092,020	$ -	$ 1,496,620	$ -	$ 1,754,480	$ -	$ 2,150,240	$ -	$ 2,518,760	$ -	$ 2,878,620	$ -	$ 3,499,400	$ -	$ 3,550,380	$ -	$ 3,555,740	$ -	$ 3,626,580

NOTES:

(1) from Yellow Jacket Drilling quote 7/29/16

(2) Injection/recovery and Hydraulic control wells will be open hole construction. Casing will be grouted to minimum of 100 feet above bedrock surface. If a well is screened (with no annular materials), the screen will be removed prior to grouting. No perforation will be necessary for injection/recovery and hydraulic control wells.

(3) Single mobilization/demobilization cost applies to all well types. The cost is Included in Injection/recovery well abandonment mob/demob

(4) Most HC wells will be open hole construction, and casing will be grouted to minimum of 100 feet above bedrock surface. If a well is screened, the screen will be removed prior to grouting. There will be no annular materials in these wells. No perforation will be necessary.

(5) It is assumed that annular materials have a porosity of 35% for grout volume calculations.

(6) Single lump sum for all wells is included under the injection/recovery well costs.

(7) Observation wells are piezometers and will not be equipped with pumps

(8) POC and Observation wells will be installed with screen and annular materials. Perforations (2 per foot) are required under ADWR's standard abandonment method. Cost assumes average 1150 feet of perforation per well, which will bring peforations well above the historical water levels, as required by the

(9) assumes average well depth of 1450 feet, average 1150 feet of grout

(10) assumes 7-inch open borehole, per Yellow Jacket quote per foot cost of $12

(11) assumes 5-inch open borehole, pro-rated abandonment cost of $7 per foot per conversation with Yellow Jacket.

(12) assumes 4-inch diameter well in 9 inch diameter borehole, 35% annular materials porosity, pro-rated cost of $10 per foot, per conversation with Yellow Jacket.

(13) assumes 10 hours of oversight per well, using Clear Creek Technician I rate for this task.

(14) assumes 1 hour of project management per well. Includes documentation and reporting of well abandonment.

(15) assumes $195 per well which includes perdiem ($100) and truck rental ($95)

(16) Perforation only in low carbon steel casing (16 NSH wells), to a minimum of 20 feet above static water level. Total footage was compiled from as-built drawings for each well.

(17) There are 16 wells with LCS casing and screen. Assumes 4-inch diameter well in 10 inch diameter borehole, 35% annular materials porosity, pro-rated cost of $12 per foot.

(18) 31 IMWs are planned for years 1-15 of operation. IMWs will be plugged and abandoned when their location is in an active mining block. In year 1 there will be 31 IMWs. By year 10, eight IMWs will have been abandoned, leaving 23.

(19) RVWs were previously used as recovery wells. Cost to abandon is same as recovery well. Approximately 10% wellfield injection recovery wells will have pumps removed and will be left open as rinse verification wells. The first RVWs will be in Year 8, representing 10% of the injection/recovery wells from year 1..

(20) Closure verificaiton wells are a subset of the RVWs. So no additional costs for closure of CVWs. They are included in the RVW closure costs.